

## CLAIMS

We claim:

1           1.       A self-aligning holographic optical system, comprising:  
2           a grating substrate supporting a holographically-formed diffraction grating  
3       and  
4           an array mount for defining relative locations of point sources of light, the  
5       array mount comprising:  
6                 recording points defining locations of point sources of recording light  
7       used to illuminate the grating substrate during fabrication of the holographically-  
8       formed diffraction grating; and  
9                 use points defining locations of light apertures used in operation of the  
10       holographically-formed diffraction grating, the use points having a defined positional  
11       relationship with the recording points, the light apertures at the use points being  
12       capable of optical communication via the holographically-formed diffraction grating.

1           2.       The system of claim 1, additionally comprising:  
2           optical fibers located at the recording points.

1           3.       The system of claim 1, additionally comprising:  
2           pinholes located at the recording points.

1           4.       The system of claim 1, wherein the apertures comprise the ends of  
2       optical fibers.

1           5.       The system of claim 1, wherein the apertures comprise an entrance slit  
2           and at least one exit slit in the array mount.

1           6.       The system of claim 1, wherein the use points comprise locations that  
2           are the same as the recording points.

1           7.       The system of claim 1, additionally comprising:  
2           a thin metallic layer coating the surface of the holographically-formed  
3           diffraction grating.

1           8.       A method of making a self-aligning optical system, the method  
2           comprising:  
3           determining a positional relationship between locations of use points and  
4           locations of recording points with respect to a holographic diffraction grating;  
5           providing an array mount having recording points and use points at the  
6           locations that satisfy the positional relationship;  
7           fabricating the holographic diffraction grating by illuminating a photosensitive  
8           layer with recording light emitted by point sources of light located at the recording  
9           points in the array mount such that light apertures at the use points in the array mount  
10          optically communicate via the holographic diffraction grating.

1           9.       The method of claim 8, further comprising:  
2           determining the locations of the recording points from design parameters of  
3           the holographic diffraction grating.

1           10.    The method of claim 8, further comprising:  
2           locating optical fibers at the recording points for emitting the recording light.

1           11.    The method of claim 8, further comprising:  
2           locating pinholes at the recording points for emitting the recording light.

1           12.    The method of claim 8, further comprising:  
2           locating ends of optical fibers at the use points to optically communicate via  
3           the holographic diffraction grating.

1           13.    The method of claim 8, wherein at least one of the use points has a  
2           same location as at least one of the recording points.

1           14.    A method of aligning an optical system with a holographically-formed  
2           diffraction grating, comprising:  
3           determining a positional relationship between relative locations of use points  
4           and recording points with respect to the holographically-formed diffraction grating;  
5           providing an array mount with the use points and the recording points at  
6           locations satisfying the positional relationship; and  
7           aligning the recording points in the array mount with the holographically-  
8           formed diffraction so that the use points in the array mount are self-aligned with the  
9           the holographically-formed diffraction grating.

1           15.     The method of claim 14, the method further comprising:  
2                 determining the locations of the recording points from design parameters of  
3     the holographic diffraction grating.

1           16.     The method of claim 14, the aligning step comprising:  
2                 producing an interference fringe pattern by illuminating the holographically-  
3     formed diffraction grating with recording light at the recording points; and  
4                 positioning the recording points to produce an interference pattern with less  
5     than one interference fringe.